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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/871,004      | 05/31/2001  | Joel W. Hoehn        | S01.12-0805         | 7513             |

7590 03/27/2003

Peter S. Dardi, Ph.D.  
WESTMAN CHAMPLIN & KELLY  
International Centre - Suite 1600  
900 South Second Avenue  
Minneapolis, MN 55402-3319

EXAMINER

PADGETT, MARIANNE L

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1762

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DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

01/871,001

Applicant(s)

Hoe hn et al

Examiner

ML Padgett

Group Art Unit

1762

— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- ☒ Responsive to communication(s) filed on 12/9/02
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- ☒ Claim(s) 1-20 is/are pending in the application.
- Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- ☒ Claim(s) 1-20 is/are rejected.
- ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- ☐ Claim(s) \_\_\_\_\_ are subject to restriction or election requirement

## Application Papers

- ☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☐ All ☐ Some\* ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
- ☐ Copies of the certified copies of the priority documents have been received

in this national stage application from the International Bureau (PCT Rule 17.2(a))

\*Certified copies not received: \_\_\_\_\_

## Attachment(s)

- ☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_
- ☐ Interview Summary, PTO-413
- ☐ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Other \_\_\_\_\_

Office Action Summary

1. Claims 1-3 and 14 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As indicated by applicants' arguments (page 7 of 12/7/02 response), applicants do NOT use substrate temperatures of  $\sim \leq 200^{\circ}\text{C}$  to remove the fullerene layers in excess of a monolayer, but use solvent or beam generators, i.e. energy beams to cause removal. Further review of the specification, reveals no enablement of use of the claimed substrate temperatures as being sufficient to cause the claimed removal. Pages 8 and 12 indicate about  $225\text{-}300^{\circ}\text{C}$  are required for fullerene to fullerene desorption, hence teach against these claims. The embodiment discussed on page 13, which includes the claimed temperature ranges of these claims, requires the use of beams, such as laser, electron or ion beams, to enable the claimed removal, so that the claimed substrate temperatures are not sufficient as implied by the present claim language. An alternate embodiment on page 18, while using substrates at less than about  $100^{\circ}\text{C}$ , preferably room temperature, requires the use of solvent in an ultrasonic agitator, thus fails to enable removal at claimed temperatures without the solvent and ultrasonics.

2. Claims 1-3 and 14-17 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for removal of fullerene to fullerene bonded/layers when using beam generators or solvents with ultrasonics, at claimed temperatures, does not reasonably provide enablement for removal of these layers without use of these beams or solvents in the claimed temperature ranges. While it is noted that on page 3, the summary teaches removal at claimed temperatures, it does not teach how this is done, i.e. enable it. The specification does not enable any person skilled in the art to which it pertains, or with which it is

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most nearly connected, to use the invention commensurate in scope with these claims.

See the above enablement discussion in Section 1. In light of and as disclosed by the specification, it appears that the two techniques of removal, via beam or solvent are critical to enabling removal at claimed substrate temperatures, and that to remove layers of fullerene on fullerene without those, is outside the scope of the enabling disclosure and the claimed invention will not work with just the use of the claimed substrate temperatures.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamza et al as applied in Section 3 of Paper No. 8.

Applicants' arguments concerning Hamza et al do not provide any reason it would not have been obvious to optimize temperature as discussed in Paper No. 8, but treat Hamza et al as if it was a 102 rejection, which it was not. Given the way, applicant has claimed the invention (presently and originally), as if substrate temperature is all that is needed to remove the layers of fullerene that is in excess of a monolayer, this rejection is being maintained, especially as page 3 of the summary is consistent with these claims. However, as other parts of the specification appear to indicate that the claimed temperatures are not sufficient to effect the removal, the above enablement rejection has been made, and the alternate information that temperatures of at least 225-300°C (pages 8 and 12) are required to desorb the layers, would effect removal of the Hamza et al reference, if the claims did not contradict such teachings by apparently using lower temperatures for removal, with no other means apparently employed.

Applicants' arguments when discussing Bethune and Hamza et al. concerning "sublimation process requires elevated temperatures, above those recited in applicants claims" (bottom of page 7) could be taken as evidence that the claims as written do NOT work. Arguments concerning the use of beams or solvent do not apply to these claims, since they are not employed or required by these claims. Either the claims as written are non-enabled/non-functional, or the obviousness arguments concerning Hamza et al are appropriate. From applicants' arguments and pages 8+12 of the specification, the examiner favors the former and not the later, but presently these claims are not commensurate in scope with applicants' arguments.

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamza et al as applied to claims 1-3, 14 and 16-17 above, and further in view of Bethune et al, as applied in Section 4 of Paper No. 8, with above arguments also applying hereto.

6. Claims 1-3, 14-15 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over IBM Bulletin (1/1994), previously discussed in Section of Paper No. 8.

The Examiner partially agrees with applicants' re-assessment of the IBM reference. While the written description therein, describes fullerene or  $C_{60}$  as deposited as a "monolayer", (1) Figures 2, 3 and 4 very clearly show more than a monolayer thickness deposited. Figures 5 and 6 no longer show the upper layer or second mono layer, however applicants have correctly pointed out that the molecules being explicitly moved are attached to the substrate, not necessarily the illustrated upper layers on the actual monolayers (1). The molecules shown floating in solution (4) are self-assembly molecules (5), which deposit on exposed substrate. However, it is not clear where the  $C_{60}$  that is "pushed away" goes, since the monolayer has no gaps to be filled. Given that excess  $C_{60}$  molecules shown on top of the monolayers are illustrated as shown in Figures 5-6, and the STM or FM tip 3 does not cause the fullerene

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molecules to double up, it would have been reasonable for one of ordinary skill in the art to consider them to be solvated by the solution, as there is no where else for them to have gone, and a monolayer is what required to be produced and finally what is shown.

For these reasons, the 102 rejection over the IBM Bulletin is withdrawn, but the 103 aspect is maintained, noting that also removing C<sub>60</sub> attached to the substrate via use of tip 3, is not excluded by the claim language which employs "comprising" and because the tip 3 provides the means of removal therefore, not the solvent by itself.

7. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over IBM Bulletin (1/1994) as applied to claims 1-3, 14-15 and 17-19 above, and further in view of Bunshah et al as applied in Section 6 of Paper No. 8.

8. Applicant's arguments filed 12/16 (9)/02 and discussed above have been fully considered but they are not persuasive. The previously noted 112 problems have been adequately corrected, however it is noted that antecedence clarity could be further improved by inserting --the-- before "layers" and "fullerene molecules" in claim 1, lines 8-9 and claims 2-3, as well as before "step (b)" or the like in claims 4, 12-13 or 18.

9. Claims 4-13 are would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

10. Any inquiry concerning this communication from the examiner should be directed to M. L. Padgett whose telephone number is (703) 308-2336, on M-F from about 8:30 a.m.- 4:30 p.m.; and FAX #are (703) 872-9310 (regular); 872-9311 (after final); & 305-6078 (unofficial).

M.L. Padgett/dh 03/17/03  
March 26, 2003



MARIANNE PADGETT  
PRIMARY EXAMINER